ESE News

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Earth Science Engineering, LLC, Clarksville and Nashville, TN

Sinkholes Formation

Sinkholes are found in geographical areas overlying water soluble bedrock. In most of Tennessee and southern Kentucky, this bedrock is limestone. Subsurface water reacts with the limestone to form a mild acid which erodes and dissolves the limestone. Over time, this process weathers limestone, forming cracks and fissures. As the groundwater circulates through them and fluctuates vertically the cracks widen into crevices and caverns underground.

The vertical fluctuation of the water along with changing flow patterns impact the overlying soils. This process can form a zone or "dome" of very saturated low strength soil that may be in addition to an area of no soil whatsoever. A sinkhole can dramatically appear because the land that usually stays intact gives way when the underground dome grows too large to support the land above. These collapses may be relatively small or large enough to destroy a structure.

The topographical type name given to areas overlying the water soluble bedrock is karst topography. The word karst is derived from a German region where scientists first studied this type of topography.

Land development practices can impact subsurface water flows and thereby cause new sinkholes on the same property; or on nearby properties in the local area.

While the risk of sinkholes is costly to eliminate (through elaborate deep foundation systems), investigative methods such as soil borings and resistivity imaging make it possible to better evaluate the potential risk.

More information about sinkholes can be found on the internet at www.sinkholes.org.

From SCINTREX, LTD. Saris Manual

Electrical Resistivity Imaging

You are probably familiar with soil boring methods, but what is Electrical Resistivity Imaging?

Resistivity is the degree to which a material resists the flow of electrical current (its resistance). This is the inverse of how well electricity flows through a material, or its conductance. Water has a high conductance (low resistivity while rock has a low conductance (high resistivity). Likewise, a wet, saturated soil would have a lower resistivity compared to a very dry soil.

Electrical Resistivity Imaging (ERI) is an advance development of the traditional resistivity surveys used to determine the electrical resistivity of soils. The survey requires up to 26 or more electrodes set out in regularly spaced array, connected to a computer-controlled resistivity meter via multicore cables. The survey data is processed by a computer model to produce graphic depth section of the resistivity of subsurface layers. The resulting diagram is similar to a topographical plan but with vertical resistance "contours" shown of the ground directly below the electrodes.

ERI is very useful in clayey soils (which are common in our area) where other subsurface imaging methods, such as Ground Penetrating Radar (GPR) are less effective.

Applications for resistivity imaging include measurements of bedrock and water table depth, buried structures, detection of solution features and voids, and identification of fracture zones.

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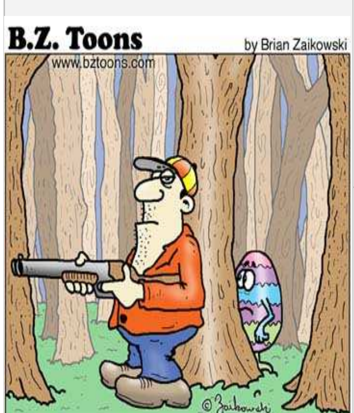


Easter egg hunt

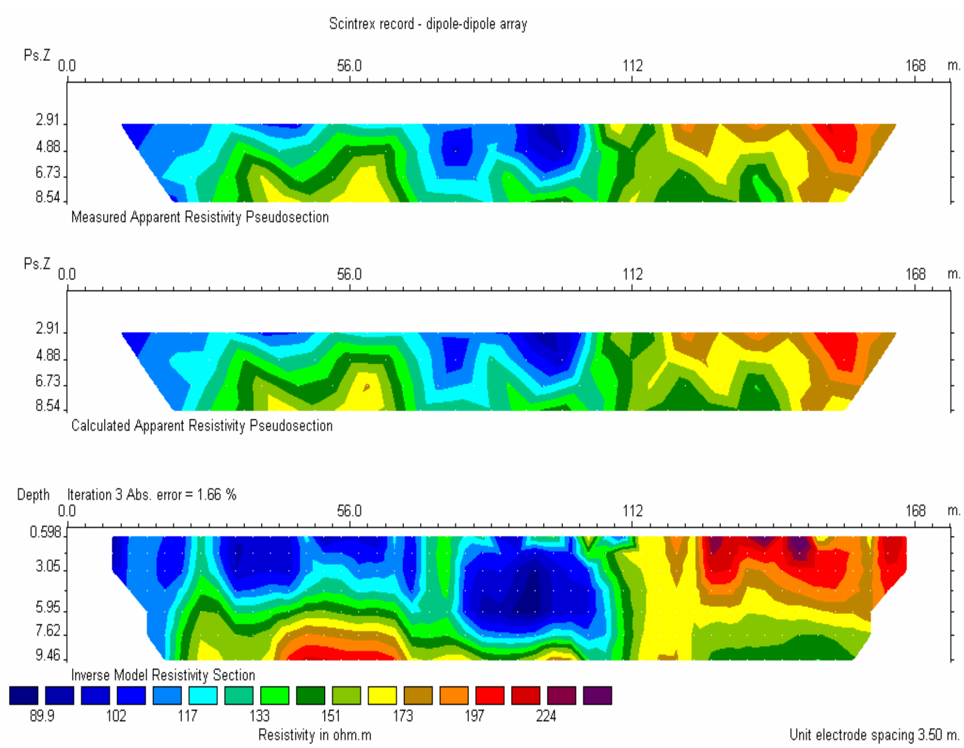
Electrical Resistivity Imaging (Continued)

The figure below illustrates the ERI results of a typical resistivity field survey. Instrument readings (current and voltage) are generally reduced to "apparent resistivity" values. Apparent resistivity is a weighted average of soil resistivities over the depth of field survey profile
.
The resistivity data is then used to create a hypothetical model of the profile and its resistivity structure. Resistivity computer models can produce a visual of the observed data.

The end product from a resistivity survey is generally a "geoelectric" color cross section or model showing thicknesses and resistivities of all the soil and rock layers.

ERI provides an inexpensive and non-invasive method of determining 2-D cross-sections of the general soil, groundwater and rock conditions in an area. ERI is often used to obtain preliminary information prior to a soil boring program.

Other applications for ERI include landfill observation, monitoring of ground water flow, and archeology.



About Our Company

Earth Science Engineering, LLC (ESE) is a Tennessee based company with offices in Clarksville and Nashville, providing professional geotechnical engineering, environmental consulting, and construction materials testing services.

ESE's in-house drilling capabilities and laboratory will benefit your project schedule by limiting delays and providing you with a single source for completing project tasks. With ESE, you have an efficient means of achieving your deadline in a cost-effective manner.

Whether you need an engineering consultant for a subsurface evaluation, an environmental assessment, or construction quality control, Earth Science Engineering, LLC brings all of these capabilities to your team.